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ABSTRACT

The sixth semi-annual report of the Sheldon Jackson College Aquaculture Program covers the period January 1 through June 30, 1977, and summarizes the last half of the second year of operation of the educational program and the entire year for the hatchery. The educational component of the program is described in terms of the academic program, aquaculture staff and students, educational and operational activities, student recruitment, funding sources, advisory services, etc. The hatchery report, which centers around the biological-physical aspects of the salmon hatchery operation and does not elaborate on the student involvement, contains the following: physical facilities expansion from 2 to 10 million alevin capacity to achieve an economically self-sustaining production level; results and data for another successful cycle of salmon egg take, incubation, and fry release, along with information on the year's marking program of pink salmon fry and coho smolts; financial budgets listing income sources and line item expenses for the past year and proposals for the next fiscal year; proposed areas of mutual interest between Alaska Department of Fish and Game and private hatcheries relative to harvest of returning fish and possible biological research; and brief descriptions of some of the initial research projects undertaken by the college. (AH)

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DEVELOPMENT OF AN APPLIED FISHERIES SCIENCE PROGRAM

FOR NATIVE ALASKANS

AT

SHELDON JACKSON COLLEGE

SIXTH PROGRESS REPORT

1 July 1977

Submitted by

Mel Seifert
Sheldon Jackson College
Sitka, Alaska

Not for publication

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REPORT SUMMARY

1. Progress and interest in salmon enhancement continue to develop in Alaska.

2. Primary program objectives remain as originally formulated: to promote Native Alaskan education and enhance salmon stocks for self-sustaining funds and the common property fishery.

3. With the introduction of a new instructor, Mack Cook, the spring semester curriculum was refined, a fisheries laboratory manual completed, work begun on revising the fall curriculum and development of a fish pathology course for the winter interim period.

4. Our first graduate is continuing his education in fisheries in Colorado. Our second graduate has been hired by the Northern Southeast Aquaculture Association as an aquaculture management trainee.

5. A second new instructor, Gabe George, assisted in all fisheries courses and taught fisheries biology. As a Native Alaskan, his communicative skills and experiences will continue to be valuable to program students.

6. Sea Grant has added support for educational activities since September 1976 and a continuing support proposal was submitted in June for the next federal fiscal year.

7. The hatchery facilities are in the process of being expanded from 2 to 10 million alevin capacity.

8. Results and data for another successful cycle of salmon egg take, incubation and fry release are reported.

9. Areas of mutual interest between ADF&G and private hatcheries are proposed.

10. Brief descriptions of some initial research projects undertaken by SJC are presented.

INTRODUCTION

The Northwest Area Foundation in 1974 provided Sheldon Jackson College with a two-year grant to develop and establish an Applied Fisheries Science Program designed for the needs of Alaska Natives and non-Native groups wishing to participate in salmon ranching. In 1976, after determination of satisfactory progress and assessment of future needs pertinent to the achievement of a self-sustaining program, a second two-year grant was provided by the Northwest Area Foundation and initial funding for the first of three years additional educational development was awarded by the Alaska Sea Grant Program. Previous semi-annual reports documented the establishment and progress of the hatchery and educational programs under the Northwest Area Foundation grant. This, the sixth semi-annual report of the Sheldon Jackson College Aquaculture Program, covers the period January 1 through June 30th, 1977, and summarizes the last half of the second year of operation of the educational program and the entire year for the hatchery.

BACKGROUND

The history of the SJC Aquaculture Program has been recorded in five earlier progress reports. During the past six months several important events have taken place which are indications of statewide interest in salmon rehabilitation projects.

Seven non-profit salmon hatchery permits have been issued by Alaska Dept. of Fish and Game (ADF&G). With the planned operation at Annette Island Reserve, this brings the total authorized facilities to eight of which three are predominantly Native in ownership.

In addition to SJC and Prince William Sound Aquaculture Corporation (PWSAC), a third hatchery, Douglas Island Pink and Chum Corporation, operated and released salmon fry for the first time in 1977.

The Forest Service has completed the Environmental Impact Statement process for the Tlingit and Haida hatchery site at Sandy Bay and the ADF&G hatchery site at Hidden Falls. In addition to PWSAC, two more regional aquaculture corporations have been formed covering all of Southeast Alaska. The Southern Southeast Regional Aquaculture Association (SSERAA) and the Northern Southeast Regional Aquaculture Association (NSERAA). These corporations by law are majority controlled by commercial fishermen and provide the organizational vehicle for private non-profit input into salmon rehabilitation efforts. These regional associations will work closely with ADF&G in overall planning for salmon enhancement within their respective areas. SSERAA formed a year ago and was officially accepted as a qualified regional association last summer and since then has conducted a stream survey for potential coho brood

stock sources, held an election among commercial fishermen to ratify a 3% mandatory assessment on their salmon catches for Association support and selected three hatchery sites intended to be in operation by 1978. NSERAA was formed in the Sitka area this past spring and qualified as a regional association in June of 1977. Local fishermen, Shee Atika Corporation, and Sheldon Jackson College was instrumental in the initial formation. Dr. Derek Poon was hired to complete the necessary organizational requirements and is now the executive director of NSERAA. Several members of the SJC fisheries staff hold interim positions until elections are held in November after fishing season. Eric Jordan, who received his two-year certificate from the SJ hatchery technician program in May, has been hired as an aquaculture management trainee to assist Dr. Poon.

Currently hearings are being held throughout the United States on HR39, the Alaska National Interest Lands Conservation Act by the Oversight and Alaska Lands Sub-Committee chaired by John Seiberling of Ohio. This legislation has evolved because of Section 17(d)(2) of the Alaska Native Land Claims Settlement Act whereby Congress directed the U.S. Dept. of the Interior to recommend up to 80 million acres of public land in Alaska for possible inclusion in the National Wildlife Refuge, National Park, National Forest, and National Wild and Scenic River systems. These are the so-called "D-2" lands which are the present focus of perhaps the greatest conservation battle in Alaska's history. One of the concerns of the aquaculture-oriented groups in Southeast Alaska is the possible loss of potential salmon hatchery sites in areas proposed as wilderness. Salmon is the basis of Southeast Alaska's lifestyle and should not be overlooked during the strife between industrial interests and preservation. The first subcommittee hearing to be held in Alaska

will be in Sitka, July 5th. The SJC Aquaculture Program Director will testify at this hearing along with others to voice our concern in this area. According to the new Assistant Secretary of Agriculture (in charge of the Forest Service) and the Forest Service here in Alaska, potential salmon enhancement projects in Wilderness can be handled in several ways. The Wilderness Act does allow temporary and administrative facilities for certain purposes. Some enhancement projects would fall into this category. Others could be assured by small deletions in the wilderness boundaries, drawn around to exclude the site. Since conservationists support the general idea of salmon enhancement in wilderness, the major problem may be in identifying those areas where some permanent facilties would be necessary as Congress most vote on the Act by December 18, 1978.

These major activities along with those reported in the last progress report bear witness to the continued progress and developing interest in Alaskan salmon enhancement endeavors. Against this backdrop our program objectives remain as originally formulated and are restated in this report in the hatchery operations section.

ADVISORY COMMITTEE

During the past three years, a Technical Advisory Committee under the chairmanship of Dr. William McNeil, has helped guide our program. (See Appendix B for current membership). This committee has met on the SJC campus each November and May to evaluate progress and suggest modifications.

(See Appendix C for Chairman's report of the May 1977 meeting). The Committee decided in May to leave it to the discretion of the Aquaculture Program staff as to whether to call one or two meetings in 1977-78.

PROGRAM STAFF

The following staff members are responsible for carrying out the program objectives: Mel Seifert, Director, is in charge of all operations. Dennis Lund, Production Manager, is responsible for expansion of hatchery facilities, hatchery production and marketing of returning adults; Mack Cook, Instructor is responsible for continued development and teaching the academic curriculum, David Bright, Aquaculture Supervisor, is in charge of the operation and maintenance of the hatchery, weir sites, and work crews; Gabe George, Teaching Assistant, is responsible for assisting and teaching of hatchery courses; Cathy Hanson is Administrative Assistant and Program Secretary.

PROGRAM PROGRESS

This sixth report covers the latter half of the second hatchery cycle and academic year. Specific program objectives are outlined in the timetable developed for the second grant application to the Northwest Area Foundation and are presented in Appendix E of the fifth progress report. The current activities are presented here under the topics of our primary objectives:

ACADEMIC PROGRAM

During the spring semester, a new curriculum was presented to 11 returning students in fish husbandry. This was the result of the introduction of a new instructor to the program. This new curriculum is a refinement of the past class material with the addition of the most recently published information on aquaculture. It also places a greater emphasis on laboratory experiences and a greater use of SE Alaska resources, such as local lakes, streams, indigenous fish species and ADF&G personnel.

The second advancement in the program has been the completion of a fisheries laboratory manual with programmed exams and the addition of several new lab exercises. The purpose of this work will hopefully be to stimulate the student with an inadequate high school background yet maintain the interest of the move advanced student. Ultimately, all the students will be able to boast the qualifications of experience in all facets of hatchery operation and an ability to predict certain problems and an understanding of how to handle them.

Our first graduate from the program will be going on to higher education in the fisheries field. Our second fisheries certificate, presented at spring commencement, went to a student who has also stayed in the field of fisheries in his occupational endeavors. Two students are now involved in commercial fishing. The remaining seven first year students are expected to return in the spring along with a group of 15 or more new individuals who have applied for admittance. Several

summer work opportunities were available for the first year students and in 3 or possibly 4 cases, students will be gaining experience in that way. Two of these students are assisting in the construction of the Sheldon Jackson raceways, which will give them unlimited potential in the fisheries job market.

This coming fall promises not only a refined fisheries program but a now wider variety of experiences. The construction of the series of new concrete raceways will increase the hatchery production to 10 million egg capacity and also provide valuable "hands on" experience with this universal type of hatchery unit.

Of course, we are all hopefully awaiting the first return of Sheldon Jackson pink salmon. The fal '77 students will also have the opportunity to witness this full fledged salmon return and the use of an enlarged weir, trap, holding area and fish ladder, all prepared for the event. This increase in production, as supervised by Dennis Lund and Dave Bright, will provide a more intense atmosphere for the students and a more impressive example of the maintenance routine common to hatcheries where they will eventually be employed.

14 students completed fish biology class as taught by Gabe George, who will be returning to assist in laboratory instruction and class loads. His recognized talent for communicating with the students, especially Native Alaskans, will once again prove invaluable, especially with the new emphasis on out-of-doors work and practical aspects of aquaculture and fisheries management.

The completion of the wet laboratory will also increase the range of the fisheries program. Already this facility has provided space for several independent student projects, research projects and a full semester of regular class exercises. The improved seawater intake, pipeline, and pump and the interior renovation are also providing increased educational latitude and a focal point for anyone visiting the fisheries laboratory.

Aquaculture Program Staff and Students. First row from left: Dave Bright, Cathy Hanson, Lee Hanson, Mel Seifert, Dennis Lund, Dave Turcott, Gabe George. Second row: Martha Hoover, Rudy Isturis, Cleo Klemzak, Judy Wohlfrom, Cindy Cook, Mack Cook. Back row: Kathy Kyle, Ed Beck, Deidra Holum, Bob Smith, Mark Berger, Tom Henderson, Jay Stelzenmuller, Jaques Vander Sandt. Missing: Eric Jordan, Jeff Katasse, Steve Staveland.

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EDUCATIONAL AND OPERATIONAL ACTIVITIES

January 7-9	Staff and students attend Alaska Aquaculture Conference in Wrangell, Director presents slide show on SJ Program.
10	Visitors: Dr. Richard Nevé, Director Seward Marine Station and Sandra Lindstrom, Commercial Fish Division, ADF&G.
12	Ladd Macauly, Alaska Dept. of Commerce contacted about non-profit hatchery loan requirements.
	Jim Parker, Commercial Fish Division, ADF&G sent request to ADF&G, Juneau for decision on SJC harvest area.
13	Hatchery tours for two pre-school groups.
14	Staff and students visit ADF&G coho facility at Starrigavan to observe operation of automatic egg pickers.
	Hatchery tour for Mt. Edgecumbe High School group.
15	Dr. Ryuki Sato, Professor of Tohoku University, Sendai City, Japan, tours SJ and ADF&G hatcheries.
17	Bob Lium, ADF&G Engineering, provides information about hatchery building costs in Alaska.
18	Captain Eugene Richards requests information about starting a salmon hatchery near Skagway.
21	Dick Marriott, Juneau and Stuart Robards, Sitka, ADF&G Sport Fish Division, discuss fishing regulations and dolly varden predation near SJ hatchery.
24	Major construction begun on sea lab room
26	Hatchery tour for two pre-school groups.
27	Alan Davis, ADF&G Commercial Fish Division takes SJ salmon fry mark requests to Mark Allocation Committee meeting in Portland.
28	Hatchery Tour for pre-school group

February	2	U. of A. Marine Advisory Program duplicates SJ salmon culture slides for their shortcourse presentation on aquaculture.
	3	Hatchery tour for Headstart instructors.
	4	Headstart instructors use hatchery tour to simulate field trip for children.
		Director speaks to SJ Forum on Aquaculture program.
	10	Hatchery tour for Village Management participants.
		Carolyn Neese requests information on starting a salmon hatchery for the village of Angoon.
	11	Hatchery tour for a Sitka fourth grade class.
	14	Al Didier, ADF&G Fish Pathologist inspects SJ hatchery.
	15	Several staff attend meeting with commercial fishermen and Shee Atika Corporation to hear Jack Milnes, Executive Director, relate history of formation of the Southern Southeast Regional Aquaculture Association.
	16	John Hughes from Pelican Cold Storage visits hatchery.
	17	Meeting held in Centennial Bldg. to determine commercial fishermen interest in forming a northern regional aquaculture association.
		Mark Jacobs, Jr., Director SEALASKA Corporation visits hatchery.
	18	Second meeting of commercial fishermen at Centennial Bldg. Agree to organize to form a regional aquaculture association.
	24	Director presents summary to date of SJ program to members of Alaska Fisheries Interagency Committee in Juneau.
	25	Ten people hired to clip fins on pink salmon fry.
March	1	Al Davis, ADF&G reports marks for pink and coho salmon approved.
	2	Began fin clipping first group of pink salmon ready to leave incubators.
	4	Hatchery tour by Alaska Congressmen Dick Eliason, Sitka; Leo Rhode, Homer; House Speaker Hugh Malone, Kenai; House minority Leader Dick Urion, Anchorage; and Rules Committee Chairman Sam Cotten, Eagle River.

March	4	First release of 1976-77 pink salmon fry into ocean.
	8	Hatchery tour by Sitka Brownie Troop. Hatchery tour by Bristol Bay Regional Development Council members: Freeman Roberts, Mayor of Dillingham; Mike Delritie, Paul Matsumo; Truman Emberg, Western Alaska Marketing Association; and Alaska Dept. of Commerce Economic Development members Ladd Macaulay, Dick Reynolds and Jim Deagen.
	10	Director participates as panelist in State of Alaska meeting on uses of local libraries.
	11	Hatchery tours for two groups of Sitka Pre-Schoolers.
	18 - 20	Staff and students operate display booth on Marine Biology and Fisheries at local trade fair.
	21	Hatchery tours for two groups Sitka sixth graders.
	24	Hatchery tour for seventh graders from Haines.
	28	Hatchery tour for Pre-Schoolers from Mt. Edgecumbe.
	29	Gary Koerner, ADF&G, Juneau, arrives with field apparatus to microwire tag coho smolts.
	30	Hatchery tour for 32 Girl Scouts and leaders.
May	2	Hatchery tour by Sitka second grade class.
	5	Hatchery tour by Sitka second grade class.
	9	Hatchery tour by two groups of high school biology students from Mt. Edgecumbe.
	10	Hatchery tour by two groups of Village Management Trainees.
	13	Last chum fry released to ocean.
	17	Meeting of SJC Aquaculture Program Advisory Board.
	18-20	Host regional meeting of Northwest Association of Marine Educators representing Alaska, Washington and Oregon.
	21	Present slide show and hatchery tour for 40 people from Anchorage Community College.

May	22	Provide beach walk for above people led by Dr. Richard Lee.
	25	Dave Choquette, Juneau, visits to discuss development of a fisheries section for a Marine Technician Program for dependent children in the Alaska Youth Village.
June	1	Marine Advisory Program requests aid in providing salmon spawning instruction for Prince William Sound Aquaculture Corporation employees.
	2	Jim Rhurman, instructor and coordinator of a Land and Resources Management Program at Kuskokwim Community College, Bethel, visits SJ program for interchange of ideas.
	7	Construction of cement egg incubation and fry rearing raceways begins with first cement pouring.
	10	National Marine Fisheries Service personnel from Auke Bay utilize SJ seawater lab to maintain live crabs being collected for oil pollution studies.
	15	Required annual hatchery report sent to ADF&G Commissioner James Brooks.
	16	Procedural meeting for those interested in testifying before the U.S. Congressional Subcommittee on Oversight and Alaska Lands to be in Sitka July 5 concerning the Alaska National Interest Lands Conservation Act (HR39).
	17	Host meeting of the National Sea Grant Site Team reviewing proposals for continuing and new projects to be funded through U. of A. Sea Grant Program. Director presented continuing support proposal for SJ Aquaculture Program.
	27	Hatchery tour for students in summer health career program.
	28	Pink salmon adults reported in Starrigavan Bay.
	30	Slide program presented for group of SJ summer work volunteers.
		Portable fishladders loaned to SJ program by ADF&G arrive. Display Coordinator for Haines State Fair in August requests exhibit from SJ Aquaculture Program. Arrangements made to do same.

STUDENT RECRUITMENT AND PROGRAM PUBLICITY

Student recruitment during spring semester centered around the program's Newsletter, tours of the hatchery by school groups and visits to high schools throughout Alaska by the SJC Admissions Office and individual staff members. To date thirteen students have signed up to begin this fall's program and at least nine of the 10 students who completed their first year are returning.

Three students have responded to our offer to pay travel expenses for a limited number of junior-senior high schoolers to visit the hatchery during salmon spawning operations this summer. One is from Nome, and the other two are Southeast Alaskans from Hoonah and Sitka. They will be our guests for a week participating in the egg taking operation and fisheries career orientation.

Visitations to high schools will resume this fall, the Aquaculture Newsletter to all high schools will be published again and a slide-tape on our program and salmon culture is under preparation. This slide-tape set will be sent to any high school instructor requesting it. A series on salmon culture will be made for instructional purposes here and elsewhere in the state where requested.

Aside from the publicity gained in recruitment and educational efforts, a display was operated at the Sitka Trade Fair and another will be maintained at the

Southeast Alaska State Fair in Haines, August 19, 20, and 21. A new program brochure which will contain updated information and photos will be completed this summer.

FUNDING SOURCES

One year remains of the two-year $214,000 grant awarded by the Northwest Area Foundation for the period of July 1976 to June 1978. This grant has made it possible to expand the hatchery salmon egg capacity this summer to a self-sustaining production level.

Last November, 1976, Sea Grant through the University of Alaska Sea Grant Program, awarded Sheldon Jackson College a $57,000 grant to support and increase the teaching staff. One of the side benefits of this grant was the additional staff support and time made available for planning and construction of the hatchery facilities during spring and summer. In June of 1977, the Aquaculture Program Director presented a second, continuing support proposal to the National Sea Grant Site Review Team composed of eleven scientists from across the United States. The site meeting this year was on the SJC campus hosted by the Aquaculture Program. The continuing proposal requested approximately $70,000. The increase over last year reflected scholarship support of $10,500 to aid program students needing financial aid to attend school. Although final word will be received on support approval until this fall, it appears at this time that it is being looked upon favorably.

A second grant proposal to the National Science Foundation Minority Instruction Science Improvement Program has been awarded for two years beginning this fall. Within the overall proposal is some $25,000 allocated to the hatchery program.

SJC is eligible for the state loan program for private non-profit salmon hatcheries and use of this fund is being considered. Also, other private agencies may be contacted for possible partial support that may be needed while the salmon returns are being built up to a program sustaining level.

In terms of long range funding, plans are under preparation for harvesting and marketing of salmon and/or eggs. Many fish processors and brokers have been contacted recently and expressions of interest are still being received for both bright and spawner carcasses. An out of state offer to buy eggs has been received and the necessary procedures to carry out this transaction are underway in case the eggs become available above that number required for Indian River and the SJC hatchery. Large returns are not expected in 1977 and 1978 as large fry releases will not be possible until 1978 from this fall's expanded egg take. In other words, the bulk of returning salmon this year and next may be required to little more than fulfill the needs of Indian River and the hatchery thus leaving few for regular pre-spawning harvest. This could make any potential egg sales very important to the interim finances of the program.

ADVISORY SERVICES

Advisory services continue through educational programs, individual and group visits to the hatchery, program publications, directing inquiries to approximate contacts, on site visits, aid to the University of Alaska Marine Advisory Program, our Aquaculture Newsletter, responses to telephone calls and letters and sharing our experiences with any who request it.

Our main service will continue to revolve around the training of future employees for the aquaculture-related industries in Alaska. More and more interest is being indicated around the state towards short term training periods on specific aquaculture subjects or at a permanent facility such as at SJC. It seems highly likely and logical that our program will be involved either on our own or in cooperation with the Marine Advisory Program and the Alaska Dept. of Fish and Game.

AQUACULTURE FACILITIES

One of the requirements of our private, non-profit salmon hatchery permit is that the Director submit an annual report to the Commissioner of the Alaska Dept. of Fish and Game by June 15th. Condition 10 of the permit describes a specific list of the minimum information that must be included. The following section is that report which was submitted and describes the entire year's hatchery operation according to the standardized format as set forth by Appendix 2 of the permit.

This is basically a report on the biological-physical aspects of the salmon hatchery operation and does not elaborate on the student involvement. All phases and procedures of the hatchery operation are utilized for their training potential and students are both required and encouraged to become involved within their maximum available time. After two successful seasons we can report their time has been well spent both for them and the hatchery.

I. ABSTRACT

The Sheldon Jackson College Aquaculture Program is completing its second year of providing an educational opportunity for Alaskans wishing to learn fish culture skills. The physical facilities are in the process of being expanded from 2 to 10 million alevin capacity towards obtaining an economically self-sustaining production level.

Results and data for another successful cycle of salmon egg take, incubation and fry release are reported. This year's marking program included pink salmon fry and coho smolts.

Financial budgets listing income sources and line item expenses for the past year and proposals for the next fiscal year are outlined.

Areas of mutual interest between A.D.F.&G. and private hatcheries relative to harvest of returning fish and possible biological research are proposed.

Brief descriptions of some of the initial research projects undertaken by SJC are presented.

II. INTRODUCTION

The Sheldon Jackson College Aquaculture Program ends it second year of operation June 30, 1977. It was initiated to provide an educational program designed to meet the needs of Alaska Natives and non-Native groups wishing to participate in salmon ranching. Hatchery operations serve to teach fish culture technician skills while a portion of the returning salmon production will provide the basic economic support to achieve our primary program objectives. These objectives remain as originally formulated:

1. To promote Native Alaskan education by providing an educational career ladder for Indians, Eskimos and Aleuts, so that what they learn can be applied to a practical and meaningful vocation.

2. To enhance salmon stocks by establishing a private hatchery on campus to produce fish for the common property fishery and as a source of self-sustaining funds for the program.

3. To promote cooperation among public and private organizations involved in the development of salmon ranching.

4. To provide technical assistance and advice to Native and non-Native corporations and individuals by sharing our own experiences and the knowledge gained from others.

III. HATCHERY MODIFICATIONS

A. Personnel

The following staff members are responsible for carrying out the program objectives: Mel Seifert, Director, is in charge of all operations. Dennis Lund, Production Manager, is responsible for expansion of hatchery facilities, hatchery production, and marketing of returning adults: Mack Cook, Instructor, is responsible for continued development and teaching the academic curriculum. David Bright, Aquaculture Supervisor, is in charge of the operation and maintenance of the hatchery, weir sites, and work crews; Gabe George

is Teaching Assistant, and is responsible for assisting and teaching of hatchery courses; Cathy Hanson is Administrative Assistant and Program Secretary. Mack Cook and Gabe George are new staff members. Mack joined the program in December of 1976 to take over the general classroom teaching duties and develop additional components such as a section on fish diseases. Gabe George, as a Southeast Alaska Native who graduated from Sheldon Jackson and Western Washington State College, brings an important viewpoint to the program based on cultural and local experience.

These additional instructors are being funded by the Alaska Sea Grant Program and this has allowed Dennis Lund to switch from full time teaching to concentrate on hatchery operations during these first crucial years. Dennis is still in charge of the Hatchery Practicum course whereby each student works in the hatchery throughout the year to gain hands-on experience of day to day operations.

B. Physical Facility

During the past year, the basic production unit continued to be a 2 million egg capacity shallow gravel incubation system. As before, there was a fish trapping area next to the incubators to which salmon were attracted by discharge water from the hydroelectric turbine in Sage Building. One room in the basement of Sage was used as a teaching wet lab and for research experiments. Another basement room was utilized for storage and shop work. The following physical additions to the program were either initiated and/or completed during the past year:

1. Wet Lab on first floor of Sage Building

A 30' x 50' room was converted from a storage and workshop area into a combination fresh and salt water wet lab. A new cement floor was poured to provide proper drainage slope and PVC pipe to the hatchery water system to provide gravity flow freshwater from Indian River was installed. About 600' of 4" PVC pipe was established into Crescent Bay to serve as an intake line for saltwater to be pumped from the basement level up to the first floor. One half of the room thus serves as a freshwater lab for student egg incubation and fish culture projects and the other half serves the same purpose with saltwater for fisheries and marine biology. Six 2' x 4' x 2' saltwater aquaria function to maintain intertidal and subtidal marine organisms for student study and public display. Several large square and round fiberglass tanks are available for organisms larger in size or numbers. During the past year, several hundred school children and adults from Sitka and other Alaska communities have visited this facility.

2. Sage Basement

Wood and fibreglass rearing tanks were added to the wet lab area for short term culture of pink and chum salmon and long term rearing of coho. Heath incubation units were increased from 2 to 6. An experimental three box stack of shallow gravel type incubators was constructed and tested with pink and chum eggs. This room will continue to be used for teaching and research with an egg incubation capcity of about 2 million eggs.

The former basement storage area was emptied and will be used next fall as an egg incubation room using the stacked gravel incubators. Capacity with this type of incubator will be about 2-5 million eggs. The main water supply pipe has been extended into this room. The seawater pump is also located here. A sump is being constructed from which a recirculation pump will return water to the incubators in case of emergency. A diesel generator is planned capable of operating several emergency water pumps if something happens to the gravity flow system.

3. Approximately one half a former sawmill building next to Sage has been allocated to the program by the college and provides a second floor storage area and first floor egg incubation and fish rearing areas of about 30' x 50' each. Part of this building is on pilings and therefore egg incubation will be tested with only limited numbers this fall while we ascertain any possible vibration problems of wave action and floating debris during the sensitive stage of egg development. Main benefit of this building for the next year will be to replace storage space eliminated by the development

of additional egg incubation and wet labs in Sage Building. The sawmill space does,however, provide for future indoor expansion.

4. The original 2 million egg capacity Netarts boxes were relocated next to the hydro tailrace after this year's salmon fry had emigrated. The plywood boxes appear to be in good shape yet after 2 years use and it is felt they will function yet for at least another 2 years. The six 4' x 48' rows have been combined into four 4' x 72' rows.

5. In the area behind Sage vacated by the Netarts boxes, a new incubation-rearing system is now under construction consisting of four concrete raceways each 8' x 60' x 3' deep. These raceways will serve as Japanese-style incubation channels (5.5 million egg capacity) and provide space for short term feeding of juvenile salmon when needed. The raceways will also afford the potential of installing in-pond incubation trays, which could increase potential egg capacity several fold. These raceways will also be protected by the back-up recirculation system.

The additional water supply for this expanded facility is available from the main hydro plant pipeline. All pipe and fittings are on hand and will be connected and operated at least several weeks before any egg take occurs. The original Netarts boxes are in operational condition now.

6. Salmon capture facilities.

A. Hydro tailrace - The hydro tailrace next to Sage Building is being enlarged to provide more adult salmon holding area. The fish will enter a secondary holding area of approximately 20' x 70' x 2½' deep via a fishpass over a dam at low tide or swim over the structure at high tide. Fish will then enter the primary sorting and holding area of about 40' x 45' through a weir

and trap structure and be maintained in floating pens behind a second dam until spawned. A beach seine is available in the event not enough salmon enter the trapping area to provide the egg requirements.

B. Indian River - The weir used at Katlian River last year will be modified by increasing height of the conduit pipe panels and used to monitor Indian River escapement for natural spawning and check all or a sample proportion of upstream migrants for hatchery identification marks. If the natural escapement level is reached and more eggs are needed to satisfy hatchery incubation capacity, some of these salmon may be utilized for spawning.

C. Donor Stream - During the past two years, donor stream eggs for the SJC hatchery have been taken at Starrigavan Creek, Katlian River and Nakwasina River. A FRED Division weir was utilized at Starrigavan Creek, a temporary SJ weir at Katlian River and a beach seine at Nakwasina River. From our experience of building a weir at Katlian two years versus using a beach seine and transporting the adults alive back to Sage, we have concluded that the latter method is more efficient and economical in results per unit of effort relative to time involved, labor requirements and material costs at least for the relatively small numbers of donor eggs with which most hatcheries will begin. Therefore, there will be no weir construction at Katlian this year. Any necessary donor stock, such as chum salmon, will be taken by seine after proper permission has been obtained from A.D.F. & G.

IV. OPERATIONAL PROCEDURES

A. Egg Takes

1. Pink Salmon - The even year 1976 pink and chum runs in Indian River and Katlian River were very low so that it was necessary to have our permit changed to get pink salmon eggs from Starrigavan Creek which had an abundant run and chum eggs from Nakwasina which had a limited but largest nearby run of that species. FRED Division has a weir and trapping facilities on Starrigavan Creek for their coho hatchery and we were graciously allowed to use it for trapping pinks. We counted pinks past the weir from August 17th until enough had gone upstream to satisfy ADF&G Commercial Fish escapement requirements for natural spawning. Then, with student help, we spawned approximately 1.9 million eggs between September 1 and 11th. The eggs were transported in ice cooled chests to the hatchery unfertilized and crossed with Indian River males trapped at our Sage hatchery weir site. To mitigate the chances of transferring any possible fish pathogens from one hatchery stream to another, we treated all Starrigavan eggs with Wescodyne after water hardening, prior to incubator stocking. Tables 1,4, and 5 present the length-weight, fecundity, and egg take data respectively for the 1976 brood year pink salmon.

The Indian River run was estimated at 150-200 pink salmon and although the weir was prepared, we felt the run was too small to justify removing any fish. No chum salmon were reported.

Runs of pinks and chums were too low to allow any egg take but our weir did operate on the South Fork of Katlian River in cooperation with ADF&G Commercial Fish Division. SJ provided the weir and ADF&G personnel erected and maintained it to count salmon and conduct adult spawner distribution and other studies. Toward the end of the season, high water washed out the weir and salvageable materials were later brought back to SJ.

The tailrace trap caught 186 pink salmon mostly males and 3 chum females which were already spent. Approximately 61,000 Indian River pink salmon eggs were taken from these tailrace fish. The pink males were used to fertilize the Starrigavan Creek eggs.

2. Chum Salmon - Permission was granted by ADF&G to take 100 female chum salmon plus enough males to fertilize the eggs from Nakwasina Bay or the mouth of the river by boat or beach seine. Large schools near the mouth of the river did not materialize so beach seining in the river intertidal area was undertaken first on September 19th. This showed us capture was quite possible but few were ripe. The eggs of 9 females were fertilized on site. Rather than camp someone by the stream to hold females until ripe, green females captured on the 19th were released and it was decided to find a method of live hauling chums back to the Sage holding area. Several commercial seiners offered the use of their vessels with pumped water capability in their holds. However, it was found difficult to coor-

Instructor Gabe George showing students Martha Hoover from Cordova and Rose Patterson of Metlakatla the correct way to weigh salmon during 1976 spawning activity.

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dinate availability of fish and seiners during the fishing season. On September 26th, beach seining produced 82 females and 58 male chums. These were put in floating pens 4' x 8' x 4' deep with lids and towed back to the Sage holding area by Dave Turcott and his troller, MARANATHA. The distance was about 14 miles and took roughly 7 hours at 2 mph. The chums line up inside the cages and swam very nicely with no mortalities or difficulty maintaining that swimming rate during the trip. They were held in similar size pens and spawned at Sage from September 19 to October 12th as they ripened and 77 fe-females produced approximately 206,000 eggs. The other 5 females escaped from the pens during the holding process. To avoid the nose damage that was known to occur on chum males held in small wire pens, the males were released into the main hydro outlet flume approximately 8' x 24' x 2' deep with cement walls on the sides and conduit pipe panels on each end. They held quite well in the current, were thus positioned above the females and no pre-spawning damage or mortalities occurred as was true of the females. Tables 2, 4, and 5 present length-weight , fecundity, and egg take data respectively for 1976 brood year chum salmon.

3. Coho salmon - Some 15 coho salmon were taken in the hydroelectric tailrace and another 13 in the overflow outlet stream of the hydro flume. From these, about 7 good females were held and spawned from October 24-5 November producing about 24,150 eggs. Tables 3,4, and 5 present length-weight, fecundity, and egg take data respectively for 1976 brood year coho.

B. Incubation and Rearing

Egg incubation in the Netarts boxes progressed without any major problems. The filamentous growth of iron bacteria recurred similar to the previous year and again was siphoned out when the boxes were cleaned as the eggs eyed up. This growth appears to cause no biological problem but does create a mechanical retardation of water flow in this upwelling type of shallow gravel incubator. This might become more of a problem with longer rows. There was some silt deposition in the upstream box of each row but not as much as last year and as before caused no suffocation of eggs.

Egg density on the 4 square foot trays was 6.7 eggs per square inch for pink salmon eggs and 3.5 egg per square inch for chum salmon eggs. With 82% swimup survival for pinks and 90% for chums, this meant a sac fry density in the gravel bottom of each box of 16.7 pinks/square inch and 9.5 chums per square inch. It is believed the lower percentage survival of the 1976 brood year pink eggs compared to the 94% of 1975 reflects the additional stress these eggs were put through during the Wescodyne treatments after water hardening and prior to incubator stocking. Viewing cleared eggs revealed nearly all mortality occured in the early stage prior to cleavage. Indian River pink salmon incubated under the same conditions had a percent eye up and hatch comparable to the 1975 egg take. These eggs were spawned and fertilized at the hatchery with no Wescodyne treatment prior to incubation. The same was true for the chum and coho eggs. Table 6 presents the temperature profile for hatchery water during 1976-77. Compared to 1975-76, water temperatures

remained several degrees higher, reflecting the relatively mild air temperatures and snowless winter experienced in Sitka. Table 7 depicts the chronology of development of eggs and alevins of the salmon species incubated in the SJ hatchery in 1976-77. Warmer temperatures speeded up egg and fry development but did not cause any oxygen problems with the densities used. Table 8 shows a typical profile of temperature-oxygen-embryo relationship for one row of the Netarts type incubation boxes. No fungus problems developed therefore no chemical treatments were given.

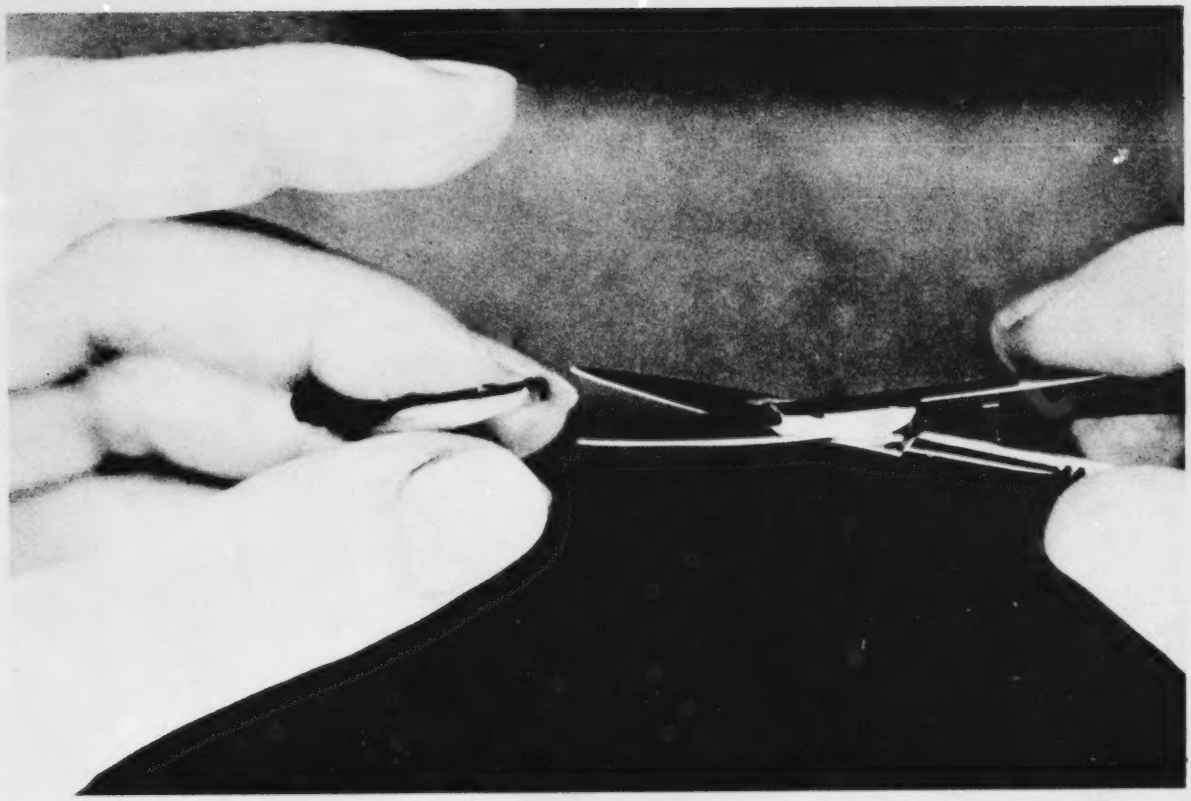
Some 400,000 pink salmon eggs were incubated in 16 tray Heath stacks until they reached the eyed stage at which point they were transferred to the Netarts boxes. This delayed stocking allowed us some maneuverability in positioning of chum eggs taken later in the season. A 16 tray Heath stack contained approximately 250,000 eggs at about 15,600 per tray. At comparable water temperature readings of 5 degrees Celsius, the dissolved oxygen readings soon after fertilization and eye-up were 11.4 ppm in top and 11.4 ppm out bottom and 11.4 in top and 11.2 out bottom respectively. Water flow rate was 6 gpm (o.38 litres/second). No fungus had developed by the time the eggs eyed up and were transferred to Netarts boxes so no treatments were administered.

Coho eggs were incubated in the Heath trays excepting for those used in some student projects. Over 90% hatched but some 18,000 were lost March 20 just prior to swimup due to debris plugging the headbox pipe leading to one of the Heath stacks. This left a few hundred being used in a student's accelerated growth project experiment. See section VII for the report on this.

Although not entirely buttoned up, pink salmon began emigrating from the Netarts boxes from February 1 to March 1, depending on their age of development. These early outmigrants were captured in Vexar plastic mesh boxes at the end of each row and returned for further development to the upper box in each row which was screened off from downstream movement. Also some were taken indoors for feeding experiments in fresh and salt water. Emigration began in earnest the first week in March and fry were captured as described and enumerated via weight displacement and sample count into two 4' x 8' x 2' deep release boxes. Both freshwater and saltwater were piped to these boxes, providing some capability of conditioning the fry to saltwater prior to release. Saltwater has to be pumped and not wanting to rely entirely on a pump system because of the possibility of electrical power failure, gravity flow freshwater provided a constant dual supply. Fry enumerating into the release boxes was usually done in the mornings. Release occured after dark thus allowing them time to recuperate from the stress of handling before having to face the new stresses of the ocean environment and predators. The water in each box was pumped down to reduce possible head pressure and then a standpipe removed allowing the fry to exit down an open trough into the tailrace stream area which was usually at high tide at release. Fry not eaten by dolly varden and other predators moved out during the next day. Table 9 provides the release data for pink salmon fry for 1977. After outmigration was completed it could be seen that virtually no mortality had occured in the incubators during sac fry development.

An approved marking program was completed on pink salmon again this year. Since ocean survival is the logical area of potential for increasing returns, it was felt appropriate to test survival of early versus late outmigrants. A goal was set of marking at least 20,000 fry of each fin clip for early unfed, early held back and fed, and late unfed. As it turned out, the early plankton development may lessen the possible differences of these three groups. Although fed frequently with an automatic fish feeder, the fed group lost weight slightly. It has been our experience for the past two seasons that it is difficult if not impossible to get pink salmon to do more than just hold their weight where fed artifical diets in fresh water. Table 10 lists the data for the 1977 pink salmon marking program. The marking was done by two crews of five people each, one crew working in the morning for 4 hours and the other working for 4 hours in the afternoon. A total of 71,985 fish were clipped in 319 man hours at an average rate of 225 fish per hour and at a cost of 2¢ per fish. Mortality from the marking program was less than 0.1 of 1%. During the process samples of clipped fish were monitored under a binoc scope for quality control.

Chum salmon showed less inclination to prematurely emigrate and after collecting some data on this from January 13 to March 11, the chum boxes were screened in to prevent voluntary outmigration. By April 19, they were buttoned up and up off the gravel. Table 11 lists the emigration data. They were captured



Marking a pink salmon by fin clipping before its release into the ocean.

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and enumerated using the same method as with the pink salmon. Some 90,000 or about half were held and fed for three weeks. During this time, they gained 55% in weight and were released May 13, at 1475/kilogram compared to 2260/kilogram for the earlier unfed. Unlike pink salmon, it is our experience that chum salmon feed quite readily on artificial diets in freshwater. During the feeding a problem we had last year recurred with a Trichodina outbreak. Formalin treatment took care of this external parasite. Just prior to release it was noted that one of the four boxes of chums had some white areas at the base of dorsal and pectoral fins. Stained slide preparations failed to identify any particular bacteria although it was likely some bacterial infection had occurred from environmental stress of rearing. These fish were treated three days in a row with 1:6000 formalin prior to release on May 13.

Since May 24, 1976, about 1,100 chum salmon from 1975 broodstock were maintained in freshwater tanks in Sage and fed Oregon Moist Diet. These fish were kept mainly for student teaching purposes but also to see if any long term rearing problems would develop with chums in fresh water. They ate and grew well, better in fact, than the group of several thousand cohos also being reared in freshwater. The only problem that did occur with these chums was development of a fungus growth under the lower jaw on a few. There was a total of about 25 mortalities during the 270 days from this which was the total loss. It was thought but never observed

that these fish may have damaged their jaw and opened it to fungus infection by rubbing against the outlet screen at the bottom of the tank. Unlike the cohos, the chums were in constant swimming motion around their tanks. Despite this apparent energy use, they outgrew the cohos and were 20/lb or 40/kg when released on February 18th, compared to the cohos which were 39/lb or 90/kg after 313 days of feeding, when released on April 5. However, the chums had grown very little during the last month although they fed and a few were developing a smolt-like appearance. For this reason and to make more room for the cohos, they were released at that time.

The coho fingerlings were from the 1975 brood stock, about 8000 had been finclipped and stocked into the upper five miles of Indian River and its tributaries on July 31, 1976. About 3200 were fed until release on April 5 of this year. As authorized by the Mark Allocation Committee, these coho were adipose clipped and tagged with microwire nose tags on March 29 and 30. Jerry Koerner from ADF&G supplied a field tagging set up and operated the tagging machine while SJ students and staff assisted. Total release was 3102 coho at 39/lb or 90/kg. These fish had reached this size in February and although healthy and eating, had only maintained their weight for about 2 months. They did not exhibit external signs of smolting, but when introduced to full strength seawater in aquaria, showed no signs of distress and would eat. They were released into the freshwater pool of the Sage tailrace where they swam around for several days moving out gradually with each high tide series.

V. FINANCIAL ANALYSIS

Budgets of program funds from the Northwest Area Foundation and Alaska Sea Grant are attached. These list line items from the current fiscal year ending June 30 and preposed expenditures for 1977-78. Actual expenditures for the past year have followed the budget outline closely and will be itemized exactly during the annual college fiscal year audit in July. The major exception is that hatchery expansion money budgeted over a two year period has all been received this fiscal year to pay for the major construction this summer. The proposed Sea Grant budget is contingent on approval of continued support.

BUDGET

EXPENSES:	1976-77	1977-78
I. SALARIES		
a. Director, year	$ 16,000	$ 16,800
b. Instructor (10 months)	15,150	15,850
c. Hatchery Supervisor, year	13,000	13,650
d. Secretary (1/2 time), year	4,000	4,200
e. Fringe benefits @ 15%	7,050	7,400
f. Student stipends for fish marking, work study • for two students, summer employment for 2 students	7,600	7,900
g. Lecturers and consultants 10 days @ $125.00	1,250	1,250
	$ 64,050	$ 67,050
II. TRAVEL		
a. Director and student to 16 communities @ 800 each to visit all sites	1,600	1,680
b. Director to travel to Seattle, Anchorage, Juneau Fairbanks for conferences, liaison	650	683
c. Lecturers and consultants	600	630
d. Village members of advisory board, 2 trips per yr for 2 members	460	483
e. 15 village high school students for summer orientation program at $115 round trip	1,725	1,811
f. Operation of school boat 8 days at $300 per day for summer program	2,400	2,520
g. Room and board for a. through e. above 75 man-days at $30/day	2,250	2,365
h. Boat gas to transport students to and from donor streams	800	840
	$ 10,485	$ 11,012
III. SUPPLIES AND SERVICES		
a. Film, tapes, instructional supplies	2,000	1,000
b. Purchased media for learning center	1,000	500
c. Long distance phone, office supplies etc	600	630
d. Printing and copies for advisory services, student recruiting, and general public	2,300	2,415
	$ 5,900	$ 4,545
IV. EQUIPMENT		
a. Fry marking equipment, scissors, nets, tubs, anesthetic, magnifying lights, rubber aprons etc.	3,000	600
b. Seawater-freshwater student lab, intake, tanks screen, pipe, etc (See Appendix 1)	17,520	1,000
c. Upgrade hatchery egg taking facilities, adult trap, ripening and sorting pool, excavation for holding area	3,000	1,000
d. Materials for egg taking facilities at donor streams, weir repair and maintenance	2,800	1,500
e. Add incubators and shelter to hatchery, includes planning, engineering, and labor	15,000	30,000
Subtotal	$ 41,320	$ 34,100
Total	$ 121,755	$ 116,707
Sources of funding assistance:		
SJC	$ 15,000	$ 9,000
NSF (tentative, $45,000)		
Requested from Northwest Area Foundation	$ 106,755	$ 107,707

SEA GRANT BUDGET

		1976-77	1977-78
A.	SALARIES AND WAGES		
	Senior Personnel	$30,000	$33,000
	Students	4,800	10,500
	Secretary	4,500	4,500
B.	FRINGE BENEFITS	5,895	7,200
C.	PERMANENT EQUIPMENT	1,350	1,500
D.	EXPENDABLE SUPPLIES	0	500
E.	TRAVEL	3,000	2,000
F.	PRINTING MATERIALS	500	750
G.	OTHER	500	500
H.	INDIRECT COSTS	7,000	8,549
	TOTAL	57,500	69,000

VI. DISCUSSION AND RECOMMENDATIONS

Probably one of the major areas of uncertainty left in the private, non-profit salmon hatchery program is what happens when adult returns begin. SJC and Prince William Sound Aquaculture Corporation may provide some preliminary experience this year but at this time there remains many vague areas of procedure for hatchery operators:

1) When fish return, is there a declared area close to the hatchery where they can be considered harvestable as hatchery fish for sale?
2) Can hatchery personnel harvest fish or is it necessary to hire a commercially licensed fishermen?
3) If commercial fishermen are hired, how are they to be selected?
4) Fish and Game regulations indicate brood stock should be taken from all parts of the run, yet a contradictory policy dictates that a stream receive its escapement quota before harvest can begin thus most salmon near the hatchery will be water marked and lessened in value.
5) As the number of hatcheries increase, both private and public, a large potential resource in the form of useable carcasses will be formed. Marketing research needs to be done on potential uses of this resource.
6) In what manner are potential egg sales to be advertised to comply with the policy of first offering them to ADF&G and then to other private hatcheries?

These are but some of the important considerations which we at Sheldon Jackson are aware of as we approach our first potential salmon return. These and others will have to be faced by all hatcheries eventually, and consistant policies need to be established before large returns begin to Alaska's hatcheries, private and public.

In the area of research, there are a number of questions we would like to investigate ourselves or see other groups and agencies undertake:

1) Standardized collection of estaurine data relative to fry release.
2) Dolly varden predation and possible control or avoidance methods.
3) Importance of releasing fry at the hatchery site for imprinting versus farther away to lessen predation.
4) Benefit, if any, of fry acclimation to saltwater prior to release.
5) Planting of eyed eggs in upper Indian River to increase natural production while avoiding carcasses above the city and hatchery water supplies.
6) Stocking of area lakes with coho fry.
7) Tagging study of returning adults for movement and homing or straying patterns.
8) Tolerance of salmon eggs to full strength saltwater at various stages of development as a potential back up water supply in case of freshwater failure.

VII. RESEARCH

The following projects were undertaken during the past year primarily as initial probing into areas of interest relative to increasing the efficiency and viability of the SJC hatchery operations. Although data was collected on each item, they were not carried out in any strict sense of scientific inquiry. Probably their biggest value was in providing some generalizations which may direct us toward more specific studies of potential benefit to our operation and perhaps others.

1) Estaurine Data - During the past spring, estaurine sampling equipment was obtained consisting of plankton nets, plankton flow meter, microscope counting cells, zooplankton counting wheel, Hensen-Stempel pipettes, camera-microscope attachment and constant temperature recorder. Plankton tows were taken and samples preserved before and during fry release. Dr. Bruce Wing from NMFS Auke Bay Lab came here to help identify specimens and discuss sampling techniques. Much of the equipment arrived too late to establish a regular routine of data collection but all should be ready next spring. Plankton sampling did show us that phytoplankton were multiplying and zooplankton immature forms were available before initial fry emigration.

2) A 40cm x 130 cm x 40cm deep plexiglass version of a box incubator was constructed with plexiglass egg trays and moveable baffles. Transparency thus allowed observation of dye movements within the box to test the effect of various positions of baffles and trays on water patterns. Such observations display visably the large variation of water velocities across various surfaces and levels within a Netarts type incubator.

3) Stacked gravel incubation boxes - One planned area of incubation this fall is a room in Sage Building basement. To achieve greatest utilization of space, some form of vertical incubator was necessary. Without a filter system, any form of deep matrix incubator would be risky during some periods of the year. Shallow gravel incubators have worked well for us under our water conditions the past two years. Therefore, we decided to test one unit of a stacked gravel incubator box. Boxes were 2' wide by 8' long by 8 inches deep and stacked three high. Water flowed in alternate direction after it dropped from a box to the next. Egg trays and baffles were arranged so that both upwelling and horizontal flow could be tested. Egg densities were such that fry loading would be about 20/cubic inch for pink and chum. There were bottom valves at various points on each box to allow oxygen analysis within the gravel substrate.

The following conclusions were drawn after fry emigration:

a) Egg and fry survival was as good as regular Netarts boxes.

b) Increasing layers of eggs increased fungus problems.

c) Mortality increased with horizontal water flow if more than 2 layers of eggs were put on screen.

d) Dissolved oxygen levels remained constant or increased from box to box.

e) Intergravel D.O. ranged from 4.8-10.4 ppm; average 7.0-8.0.

f) No iron bacteria developed in horizontal flow sections but did in upwelling sections.

g) chums seemed to migrate out early possibly due to too much light exposure or as yet undefined reasons.

h) when baffles were added to increase gravel D.O., bunching of fry away from the baffles occurred.

i) No hesitation of fry to emigrate from unit.

4. Plexiglass cylinder with artificial turf substrate - Three 3-inch diameter, 30" long plexiglass cylinders with water inlets or outlets at each end were constructed to view possible movements of salmon sac fry through layers of artificial turf substrate. This has been done two years now, both as a test of a substrate and as a demonstration for students. Turf was either cut in 3 inch diameter pieces and layered or rolled on end and inserted into the tubes with fibers pointing out. Water flow was upwelling in one tube, downflowing in another and the third tube layed. horizontal. Cylinders were covered with black plastic on the outside to exclude light. The same general conclusion was always reached: no matter what direction the water flow, fry always migrated to the bottom position within 48 hours.

5. Horizontal water flow rate and premature migration - Heath trays were arranged so that four had small pebble substrate and PVC saddle cover. Pink salmon eyed eggs were introduced at 10/square inch. Water flows were 1, 2, 3, and 5 gpm and directed horizontally across the substrate. The next tray below each of the four was set up to capture emigrating fry. This experiment had water flow problems, as is often true with small flows, but it can be said generally that no suffocation occurred even at 1 gpm and PVC saddles seemed to inhibit premature emigration. Fry that did move were preserved for later quality analysis.

Results showed a much higher percentage of fry remained on the tray with PVC saddle cover until button up than on the tray with just gravel.

7. Accelerated Cohos - Tom Henderson, a second year fisheries student from Haines, Alaska, undertook a field project wherein he increased the growth rate of coho salmon through use of heated, re-circulated water. The problem he was addressing was "Can coho salmon be reared to smolt size in one year or less by use of heated water system and acclimated to seawater?"

The eggs of coho salmon were incubated in water heated to 9.5 degrees C. starting October 25, 1977. Total time from egg take to swim up was 9-10weeks versus 26 weeks for normal water temperatures. After heating, fry were divided into 2 groups. One group of 112 fry were put into a tank with normal water temperatures of 5.5 degrees C. Another 750 fry were kept in a tank with water being recirculated through biological and sand filters and maintained at 9.5 degrees C. with 10% freshwater replacement. Measurement of the fry at age 15.5 weeks showed the warm water coho to be over 200% heavier and 23% longer than those in colder Indian River water. Largest of these fry were about 72mm and some were acclimated to full strength sea water over a one week period. They did not exhibit any observed feeding activity during this acclimation period but did survive and later began feeding on zooplankton being pumped into the saltwater aquaria along with the water from Crescent Bay in front of Sage Building. Although they retained their parr marks for some time, they did assume a silvery appearance. Those fish are still alive and feeding vigorously in the aquaria at the time of this report. Because the freshwater hatchery was being shut down for expansion work during the summer, the re maining coho from this experiment were turned loose in the tailrace area.

8. Netarts early emigrants - Numerical data was collected on early out-migration of pink and chum salmon fry from the six rows of shallow gravel incubators from mid-January to mid-March. Every other row was completely covered with black plastic to exclude all light. The other three rows had only styrofoam sheets floating on the water and plywood lids. Fry were captured and enumerated as described in an earlier section for fry release. Each row showed a similar pattern of fry dribbling out at a low rate of 10-50 per day in pre-buttoned up stages for about 3-4 weeks, then increased to several hundred per day for 2-3 weeks, then began emigrating in earnest as buttoning up occurred. The degree of out migration appears to be more related to age rather than darkness within the incubation unit.

Table 1 Length-weight data on 1976 pink salmon from SJC hydro tailrace (Indian River water) and Starrigavan Creek, Sitka. Length measured from mid-eye to fork of tail.

Females	Length(cm.)	Weight(kg.)	Sample size
Indian River	Average 51.7 Range 49.4-53.8	2.14 1.86-2.45	5
Starrigavan	Average 52.6 Range 46.5-60.0	2.16 1.59-3.18	100
Males			
Indian River	Average 51.6 Range 40.0-58.0	1.86 0.77-2.94	46

Table 2 Length-weight data on 1976 chum salmon from Nakwasina River. Lengths measured from mid-eye to fork of tail.

	Length(cm)	Weight(kg)	Sample size
Females	66.1	4.35	61
Males	67.8	5.18	5

Table 3 Length-weight data on 1976 coho salmon from Indian River

	Length(cm)	Weight(kg)	Sample size
Females	62.0	3.65	7
Males	56.9	2.80	11

Table 4 Pink and Chum Salmon Fecundity, 1976

Method used for fecundity estimation:

24 pink salmon yield 8530 ml soft eggs = 355.4 ml/female

Groups of females measured periodically to get average. Subsample 610 ml soft eggs = 820 ml after 2 hours water hardening = 3345 eggs by actual count. Eggs expanded 34%.

$$\frac{610 \text{ ml}}{3345 \text{ eggs}} = \frac{355.4 \text{ ml}}{x \text{ eggs}} \qquad x = \frac{(355.4)\ (334.5)}{610} = 1949$$

Based on the above method:

Fecundity for Starrigavan Creek pink salmon = 1949 eggs/female

Fecundity for Indian River pink salmon = 1851 eggs/female

Fecundity for Nakwasina River chum salmon = 2691 eggs/female

Fecundity for Indian River coho salmon = 3450 eggs/female

Table 5 1976 Salmon egg take for SJC Hatchery

Female Source	# Females	# Eggs	# Males	Male Source
Pink Salmon				
Starrigavan Creek	969	1,888,581	176	Indian River
Indian River	33	61,083	10	Indian River
Totals	1002	1,949,664	186	
Chum Salmon				
Nakwasina River	77	206,821	58	Nakwasina River
Coho Salmon				
Indian River	7	24,150	11	Indian River

Table 6 Water temperatures at SJC Hatchery 1976-1977, recorded by Taylor 7 day Thermograph in degrees Celsius

	High	Low	Mean
June	7.0	4.5	5.2
July	10.0	5.0	6.8
August	13.0	7.0	8.4
September	9.0	6.0	7.5
October	7.0	4.5	6.2
November	6.5	3.5	5.0
December	5.0	3.0	4.1
January	5.0	3.0	4.1
February	5.0	3.5	4.4
March	5.0	2.5	3.4
April	6.5	2.5	4.0
May	6.0	4.0	5.0

Table 7 Chronology of development of eggs and alevins of pink, chum and coho salmon at SJC Hatchery, 1976-77

Species	Spawned	Eyed	T.U.'s	Hatch	T.U.'s	Swim up	T.U.'s
Pink	9-1	10-25	622	12-3	975	3-2	1283
Chum	10-12	11-28	614	12-18	1034	4-26	1836
Coho	10-25	12-10	445	1-28	677	3-28	1130

Table 8 Typical dissolved oxygen readings for one 32' row of Netarts boxes at various stages of pink salmon development. Flow rate 25 gpm (1.58 litres/second), egg density 375,000 per row.

Stage of Development	Month	Water Temp.	D.O. in	D.O. out
Fertilized	Oct.	6 C.	10.0	8.2
Eyed	Nov.	5 C.	11.6	11.4
Hatched	Jan.	4 C.	13.0	11.8
Pre-Swim up	Mar.	3.5 C.	11.4	10.6

Table 9 Pink salmon fry released spring of 1977 from SJC Hatchery

Date		Number Released	Number/Kilogram
March	4	93,530	3160
	5	64,176	2960
	8	33,462	3160
	12	40,967	3090
	14	21,184	
	15	122,060	
	16	203,744	
	17	137,274	
	18	119,356	
	19	43,061	
	20	54,621	
	21	165,307	
	24	50,942	3130
	25	94,650	
	26	28,501	
	29	107,743	
April	3	16,590	
	5	83,385	3280
	8	17,731	
	11	51,300	3310
	12	10,000	
	15	33,600	
	Total	1,593,184	

Table 10 Pink Salmon Marked Fry Release 1977

AD = Early unfed

LV = Early fed

RV = Late unfed

Marked	Released	AD	LV	RV	Fish/kg
March 1-3	March 4	22,959			3160
March 7-9	March 25		24,991		3340
March 23-25	March 25			24,035	3130

Table 11 Chum salmon fry released spring 1977 from SJC Hatchery

Date		Number Released	Number/Kilogram	
April	19	10,029	2257	Unfed
	20	15,052		
	21	10,956		
	22	10,240		
	23	12,595		
	25	16,138		
	27	21,196	2260	Unfed
May	13	90,681	1475	Fed
	Total	186,887		

ACKNOWLEDGEMENTS

Many thanks have been offered in every past report to many people and agencies which support this program in a variety of ways. After a number of reports it seems to become more difficult to express gratitude in an innovative manner.

Perhaps then the time is appropriate to simply say that neither the support nor the gratitude have lessened. Thank you to all our supporters from funding agencies to those who merely wish us well. I am happy to report that because of you we are making it.

APPENDIX A-1

Financial Report July 1, 1976 to June 30, 1977 - Northwest Area Foundation Funds

	Budgeted	Spent	Balance
I. Salaries			
Staff and Students	58,000	57,942	58
Benefits	7,050	5,829	1,221
II. Travel	5,435	1,969	3,466
III. Supplies and Services Instruction, Office and Printing	5,900	4,440	1,460
IV. Equipment			
Seawater Lab	17,520	16,000	1,520
Hatchery Construction	35,432	25,054	10,378
Other	8,800	5,540	3,260
V. Misc.	4,514	4,156	358
VI. SJC Matching	15,000	15,000	0
TOTALS	157,651	135,930	21,721

NWA Grant	214,452
SJC Matching	24,000
Spent 76-77	135,930
Balance 77-78	102,522

APPENDIX A-2

Financial Report September 1, 1976 to June 30, 1977 - Sea Grant Funds

	Budget	Spent	Balance
I. Salaries	41,800	31,810	9,990
Benefits	6,270	5,178	1,092
II. Travel	3,000	3,708	-708
III. Office	1,000	876	124
IV. Equipment	1,350	1,292	58
V. Indirect Costs	7,000	5,358	1,642
TOTALS	60,420	48,222	12,198

APPENDIX B

TECHNICAL ADVISORY COMMITTEE

Chairman:

Dr. William McNeil
General Manager
Ore-Aqua Foods

Dan Rosenberg
Metlakatla Island Res.

W.I.(Bob) Palmer, Director
Alaska Fisheries Council

Donald Barrett
Career Education Coordiantor
Tlingit and Haida Indians

Peter Azure, Director
Native Studies Program
Sheldon Jackson College

Richard Eliason
State Representative

Ross Soboleff, Director
Office of Development Planning
Tlingit and Haida Indians

Charles Osborne
Biologist
U.S. Fish and Wildlife Service

Mark Jacobs, Jr.
Board of Directors
SEALASKA Corporation

Chet Mattson
Research Biologist
National Marine Fisheries Service

Dr. Ken Leon
Biologist
Alaska Dept. of Fish and Game

Dr. Richard Nevé
Coordinator of Shore Programs
Univ. of Alaska

Representative
Alaska Native Brotherhood

James Parker
Area Management Biologist
Alaska Dept. of Fish and Game

Edwin Scholz
Assistant to the President
for Advancement at SJC

Alan Otness
Administrative Assistant
Petersburg Fisheries Inc.

Dr. Richard Gard
Division of Fisheries
Southeastern Senior College

Dexter Kyle
Southeast Alaska Trollers Association

Ken Thompson
U.S. Forest Service

Martha Hoover
Student Representative
Fish Husbandry Class

William J. Stelzenmuller
Student Representative
Fish Husbandry Class

Dr. Richard Lee
Marine Education Specialist
Univ. of Alaska

APPENDIX C

SHELDON JACKSON COLLEGE AQUACULTURE PROGRAM

TECHNICAL ADVISORY COMMITTEE MEETING
May 17, 1977

CHAIRMAN'S REPORT

Almost two million juvenile salmon were released from the hatchery in the spring of 1977, including approximately 1.6 million pink and 0.2 million chum salmon. Approximately 0.1 million chum were fed about four weeks prior to release. A few thousand coho salmon were also fed and released. Egg to fry survival was about 83% for pink and 90% for chum salmon.

Plans are progressing for harvest of adult pink salmon returning to the hatchery in fall 1977. ADF&G has given SJC exclusive rights to harvest fish in a six square mile salt water area adjacent to the hatchery. The exclusive fishing zone will be closed to all sport and commercial fishing. The closure is endorsed by the local Fish and Game Advisory Board.

Construction of new hatchery facilities is progressing on schedule. Completion of this work will increase capacity of the SJC production hatchery from two to ten million eggs. The student laboratory area will be capable of handling up to two million additional eggs.

The existing Netarts-type incubation boxes have been relocated to a newly filled area adjacent to the former site and near the tailrace from the SJC hydro generator. Four concrete raceways (each 8' x 60' x 3' deep) will be constructed in the area vacated. The raceways will serve as Japanese-style incubation channels (5.5 million egg capacity) and provide space for short term feeding of juvenile salmon. The raceways will also afford the potential of installing in-pond incubation trays, which would increase potential egg capacity several-fold over Japanese style incubation channels. The Weyerhauser Company will cooperate with SJC by providing specially designed in-pond incubation trays for evaluation in 1977-78.

A former sawmill near the hatchery is undergoing renovation as a part of the hatchery expansion. The sawmill will be used primarily for storage, but it will also provide 1500 square feet of floor space for future incubators. However, this space is not considered in calculating immediate expansion plans. Instead, the basement of the Sage Building is being modified to receive stacked Netarts-type incubation troughs. Capacity of the stacked troughs will be 2.5 million eggs.

To summarize, projected egg capacity by August 1977 will include:

Netarts incubators	2.0 million
Japanese-style incubators	5.5 million
Stacked Netarts incubators	2.5 million
Total production hatchery	10.0 million
Student laboratory	2.0 million
Total combined production	12.0 million

Future installation of incubators in sawmill and installation of in-pond incubation trays in raceways could potentially double or triple capacity planned for 1977.

The seawater laboratory in the Sage Building is now functional. About 50% of this laboratory is devoted to marine biology and about 50% to student aquaculture projects.

Student enrollment in aquaculture held up much better this past year than in former years. Of the 19 students starting in autumn of 1976, 10 remained enrolled at the end of the year. A new laboratory manual for aquaculture has been written. Recruitment efforts are underway for the 1977-78 academic year.

The program will become more dependent upon internal sources of funding including sales of hatchery fish, after June 1978, when the present grant from the Northwest Area Foundation ends. Financial support is also obtained through the University of Alaska Sea Grant Program and the National Science Foundation.

Attending the Technical Advisory Committee meeting were:

Donald Barrett - Tlingit-Haida Central Council
Jim Barry - U.S. Fish and Wildlife Service - Ketchikan
Charles Bovee - SJC
Dave Bright - SJC
Mack Cook - SJC
Dick Gard - University of Alaska, Juneau
Gabe George - SJC
Mark Jacobs, Jr. - SEALASKA Corporation
Rich Lee - University of Alaska Marine Advisory Program
Ken Leon - Alaska Dept. of Fish and Game, Juneau
Dennis Lund - SJC
Bill McNeil - Weyerhauser Co. (Oregon Aqua-Foods)
Dick Neve - University of Alaska, Seward
Jim Parker - Alaska Dept. of Fish and Game, Sitka
Dan Rosenberg - Metlakatla Indian Community
Ed Scholz - SJC
Mel Seifert - SJC
Jay Stelzenmuller - Student Representative
Ken Thompson - U.S. Forest Service, Sitka
Dave Turcott - SJC